

**Field-Grown Floriculture Products:  
An Economic Assessment of the  
Feasibility of Providing Multiple-Peril Crop Insurance**

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## Executive Summary

Floriculture refers to the cultivation and management, usually on a commercial scale, of ornamental and flowering plants. The Census of Agriculture, which is the main source of data for the industry, defines floriculture crops as including bedding plants, foliage plants, potted flowering plants, cut flowers, and cut cultivated greens.

The Census reported \$3.5 billion worth of floriculture crops grown on 25,477 U.S. farms in 1992. Floriculture production that year covered about 656 million square feet of land under protective cover and 61,000 acres of open-field land. The Economic Research Service estimated that wholesale floriculture sales in the United States totalled \$5.7 billion in 1992.

Most foliage and flowering plants are sold in containers. However, some are grown in-ground for a period of time before they are transplanted into containers. These plants are part of a grower's in-field inventory while in the ground and could be covered by an in-field crop insurance policy. The extent of in-ground production depends on the climate and the type of floriculture crop.

Among the floriculture groupings, cut flowers and cut greens are the most likely plants to be grown in-ground for an entire life cycle. Bedding plants are at times grown in the open field for the entire production cycle. Some field-grown foliage plants and potted flowering plants are grown in the ground for a period of time and then transplanted into containers.

Dracaena, ti-leaf, sansevieria, and ficus are some examples of foliage plants that can be grown in-ground. In addition, potted chrysanthemums sold at garden centers and discount stores (Wal-Mart, K-Mart, etc.) during the fall are usually grown in the ground for a period of time. Examples of field-grown cut flowers are cut snap dragons, stock, orchids, and gladioli, while cut cultivated greens include cut leatherleaf ferns and chamaedorea.

U.S. domestic floriculture production had an estimated farm value of \$3.7 billion in 1993, up 56 percent from 1986. Wholesale cash receipts for floriculture products, including the value of imports, were estimated at \$6.1 billion in 1993, up from \$3.9 billion in 1986.

U.S. retail purchases of floriculture plants have risen almost consistently since 1986. Consumer purchases totalled \$12.6 billion in 1993, up 47 percent from 1986. Retail expenditures for floriculture products were approximately \$36 per capita in 1986 and \$49 per capita in 1993.

The demand for floriculture products, especially the demand for cut flowers, is highly seasonal. Sales are greatest from February through May, and during the fall, and lightest during the summer. Sales of cut flowers peak around holidays, such as Valentine's Day and Mother's Day. Cut flowers and foliage plants, however, are becoming increasingly popular for everyday use.

Most ornamental foliage plants are tropical and do not tolerate freezing temperatures. Foliage plants may begin to show signs of slow growth or plant damage as temperatures reach 90° F and above, or as they drop below 50° F. Hot, humid weather is an often-cited barrier for cut flower production. Many varieties do not bloom at all or are of poor quality during hot weather, especially when night-time temperatures remain high.

Floriculture crops can be produced on many soil types, but a fertile soil with good drainage and good aeration is ideal. Most cut flowers grow best if there is some organic matter in the soil. For a few species, such as most wild flowers, ferns, alpine plants, and desert plants, a less fertile soil is best. Poor aeration can reduce plant growth or kill the plant by restricting the absorption of water and nutrients by the roots. Most growers use irrigation.

The major production perils confronted by in-ground floriculture producers are excessive rain, high winds, and freezing temperatures. Excessive rains and high winds are a particular problem in the coastal areas of Florida and Texas. The extent of insect and disease problems varies across areas but, in general, these problems can be controlled through prudent management practices.

Our assessment is that most growers who will participate in a potential in-field crop insurance policy for floriculture crops will only apply for the minimum catastrophic coverage. However, growers whose farms are located in areas prone to hurricanes, such as the Coastal counties in Florida and Texas, will likely opt for a higher coverage.

The greatest interest in purchasing buy-up insurance for in-ground nursery crops will likely be from cut-flower producers, particularly those from Florida, Texas, and California, where heavy rains and freezing temperatures can be a problem.

Ad hoc disaster payments data provide further evidence that the greatest interest in insurance may lie with growers in the South. A large amount of ad hoc disaster assistance payments for floriculture crops were reported in the South over the 1988 to 1993 period, a majority of which were collected by Florida growers. Most of the losses were due to strong winds and floods from hurricanes and freezing temperatures. Except for cut flowers and cut greens, the southern region received at least 90 percent of total disaster assistance payments for floriculture crops.

Because there are few growers of in-ground floriculture crops, the potential market for such a policy is limited. Some floriculture crops are grown in-ground and exposed to full sun for some period during their production, but a large proportion of floriculture crops are produced in some type of container throughout their life cycle, and these would be covered by the policy for containerized plants. The major floriculture crops grown in-ground for an extended period are cut flowers and cut greens.

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**Field-Grown Floriculture Crops:  
An Economic Assessment of the  
Feasibility of Providing Multiple-Peril Crop Insurance**

**Introduction**

Floriculture refers to the cultivation and management, usually on a commercial scale, of ornamental and flowering plants. The Census of Agriculture, which is the main source of data for the industry, defines floriculture crops as including bedding plants, foliage plants, potted flowering plants, cut flowers, and cut cultivated greens. The floriculture industry is a component of the U.S. greenhouse and nursery industry.

The Census reported \$3.5 billion worth of floriculture crops grown on 25,477 U.S. farms in 1992. Floriculture production that year covered about 656 million square feet of land under protective cover and 61,000 acres of open-field land (Appendix table 1a). The Economic Research Service estimated that wholesale floriculture sales in the United States totalled \$5.7 billion in 1992 (Table 1).

Most foliage and flowering plants are sold in containers. However, some are grown in-ground for a period of time before they are transplanted into containers. These plants are part of a grower's in-field inventory while in the ground and could be covered by an in-field crop insurance policy.

Depending on the climate, in-ground floriculture crops can be produced either in full sun or under some type of protective structure, such as a shade cloth. The "State Analyses" section provides region- and variety-specific details on production practices.

This report examines those aspects of the field-grown floriculture industry that relate to the demand for crop insurance and the feasibility of developing an in-field crop insurance policy for floriculture products.

**Classification of Floriculture Crops**

This report focuses on four aggregate product sectors: foliage plants, potted flowering plants, bedding and garden plants, and cut flowers and cut cultivated greens. Cut flowers and cut greens are the most likely plants to be grown in-ground for an entire life cycle. Bedding plants are at times grown in the open field for the entire production cycle. Some field-grown foliage plants and potted flowering plants are grown in the ground for a period of time and then transplanted into containers.

Dracaena, ti-leaf, sansevieria, and ficus are some examples of foliage plants that can be grown in-ground. Potted chrysanthemums sold at garden centers and discount stores (Wal-Mart, K-Mart, etc.) during the fall are usually grown in the ground for a period of time. These potted chrysanthemums are hardier

Table 1--Floriculture crops: Value of U.S. wholesale production, supply, and retail consumer expenditures, 1986-93

Subsector U.S. grower and share of year domestic sale change		Production and supply 1/				Retail consumer		
		Domestic production	Imports	Exports	Wholesale supply	Total	Per capita	Annual change
		----- 1,000 dollars -----					Dollars	-----
-- Percent -----								
Cut flowers: 3/								
1986		423,325	234,895	18,500	959,580	3,838,318	15.98	N/A
63.3	N/A							
1987		478,161	243,609	18,610	1,054,740	4,218,960	17.41	9.9
65.4	13.0							
1988		517,934	283,505	19,760	1,172,519	4,690,076	19.18	11.2
63.7	8.3							
1989		545,850	315,652	10,773	1,276,093	5,104,371	20.68	8.8
62.9	5.4							
1990		529,095	326,246	29,545	1,238,694	4,954,776	19.87	-2.9
60.5	-3.1							
1991		533,434	322,016	33,699	1,232,627	4,930,508	19.55	-0.5
60.8	0.8							
1992		518,881	352,366	32,504	1,258,115	5,032,458	19.73	2.1
58.0	-2.7							
1993		473,644	382,181	33,000	1,234,237	4,936,948	19.14	-1.9
53.6	-8.7							
Potted flowering plants: 3/								
1986		547,503	11,334	27,173	797,496	1,220,002	5.08	N/A
97.9	N/A							
1987		648,240	13,661	23,857	957,066	1,450,893	5.99	18.9
97.9	18.4							
1988		715,114	15,813	32,208	1,048,079	1,596,710	6.53	10.1
97.7	10.3							
1989		758,066	19,972	1,358	1,165,020	1,719,609	6.97	7.7
97.4	6.0							
1990		746,482	17,912	634	1,145,641	1,692,544	6.79	-1.6
97.7	-1.5							
1991		814,493	21,733	711	1,253,273	1,848,376	7.33	9.2
97.4	9.1							
1992		823,246	26,654	989	1,273,367	1,871,552	7.34	1.3
96.9	1.1							

1993		805,436	26,691	363	1,247,646	1,831,978	7.10	-2.1	
96.8	-2.2								
Foliage plants: 3/									
1986		612,660	21,206	20,942	919,387	1,378,684	5.74	N/A	
96.5	N/A								
1987		603,174	21,866	25,006	900,051	1,354,787	5.59	-1.7	
96.4	-1.5								
1988		565,959	22,328	31,578	835,063	1,266,470	5.18	-6.5	
96.0	-6.2								
1989		574,443	22,181	18,079	867,818	1,295,573	5.25	2.3	
96.2	1.5								
1990		607,757	25,064	53,988	868,249	1,345,759	5.40	3.9	
95.7	5.8								
1991		575,568	26,873	51,407	826,550	1,276,627	5.06	-5.1	
95.1	-5.3								
1992		623,256	30,079	46,355	910,470	1,390,119	5.45	8.9	
95.0	8.3								
1993		661,687	36,789	41,616	985,290	1,485,176	5.76	6.8	
94.4	6.2								
Bedding plants: 3/ 4/									
1986		672,420	N/A	N/A	1,008,630	1,512,945	6.30	N/A	
100.0	N/A								
1987		817,960	N/A	N/A	1,226,940	1,840,410	7.60	21.6	
100.0	21.6								
1988		906,676	N/A	N/A	1,360,014	2,040,021	8.34	10.8	
100.0	10.8								
1989		1,076,274	N/A	N/A	1,614,411	2,421,616	9.81	18.7	
100.0	18.7								
1990		1,124,404	N/A	N/A	1,686,607	2,529,910	10.14	4.5	
100.0	4.5								
1991		1,284,429	N/A	N/A	1,926,644	2,889,966	11.46	14.2	
100.0	14.2								
1992		1,391,175	N/A	N/A	2,086,763	3,130,144	12.27	8.3	
100.0	8.3								
1993		1,605,068	N/A	N/A	2,407,602	3,611,403	14.00	15.4	
100.0	15.4								
Cut cultivated greens: 3/									
1986		101,296	19,130	5,451	172,463	603,621	2.51	N/A	
83.4	N/A								
1987		116,317	24,350	5,560	202,661	709,312	2.93	17.5	
82.0	14.8								
1988		119,580	21,632	7,746	200,199	700,695	2.87	-1.2	
83.8	2.8								
1989		130,238	12,926	8,245	202,379	708,327	2.87	1.1	
90.4	8.9								
1990		120,570	13,647	8,778	188,159	658,555	2.64	-7.0	
89.1	-7.4								
1991		124,479	13,053	7,040	195,737	685,080	2.72	4.0	
90.0	3.2								
1992		126,223	14,997	10,894	195,489	684,212	2.68	-0.1	
88.5	1.4								

1993	131,028	20,413	10,379	211,593	740,577	2.87	8.2
85.5	3.8						
All floriculture:							
1986	2,357,205	286,565	72,066	3,857,555	8,553,571	35.62	N/A
88.9	N/A						
1987	2,663,852	303,486	73,033	4,341,458	9,574,361	39.52	11.9
89.5	13.0						
1988	2,825,263	343,278	91,292	4,615,873	10,293,972	42.10	7.5
88.8	6.1						
1989	3,084,871	370,731	38,455	5,125,720	11,249,497	45.58	9.3
89.2	9.2						
1990	3,128,309	382,869	92,945	5,127,349	11,181,545	44.83	-0.6
88.8	1.4						
1991	3,332,403	383,675	92,857	5,434,831	11,630,557	46.13	4.0
89.4	6.5						
1992	3,482,781	424,096	90,742	5,724,203	12,108,485	47.47	4.1
88.9	4.5						
1993	3,676,863	466,074	85,358	6,086,369	12,606,081	48.88	4.1
88.5	5.6						

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N/A = Not available. 1/ Equivalent wholesale values. 2/ Excludes services such as landscaping, installation, and maintenance. 3/ Wholesale values of production have been expanded by the ratio of commercial data reported in 28 major States to the U.S. Census of Agriculture. 4/ Minor quantities of imports and exports are included in other greenhouse and nursery products.

Source: U.S. Department of Agriculture, Economic Research Service, Commercial Agriculture Division.

varieties than those sold by retail florists or supermarkets, and homeowners prefer the hardier plants for outdoor gardens.

### Bedding and Garden Plants

Bedding and garden plants are young flowering plants or vegetable plants sold mainly for outdoor or patio use in flower beds, borders, patio planters, and home gardens (Johnson and Johnson). This diverse group is characterized by plants without woody stems, and they are often grown in cell packs in a controlled environment (Behe).

Impatiens were the best-selling bedding plant in the U.S. in 1994 (Professional Plant Growers Association Survey). Other popular flowering bedding plants were petunias, geraniums, pansy, marigold, vinca, tomato, dianthus, begonia, and lobelia (see Appendix table 2). The bedding plants that are most commonly produced in-ground are vegetables intended for transplanting into home gardens or for commercial vegetable crop production.

### Cut Flowers and Cut Cultivated Greens

Field-grown cut flowers are grown primarily for their blossoms (for both fresh or dried arrangements), and the plant remains in the field throughout its productive life. After the flowers are harvested, the plants are either discarded or, depending on the variety, they may be maintained while they produce additional flowers. Some examples of field-grown cut flowers are cut snap dragons, stock, orchids, gladioli, and chrysanthemums.

Cut cultivated greens are crops grown mainly for their showy foliage. These are grown and marketed similarly to cut flowers. Some examples of cut cultivated greens are cut leatherleaf ferns, chamaedorea, and miscellaneous greens (see Appendix table 2).

### Foliage Plants

Foliage plants are produced for their decorative shape, size, color, and stem and leaf characteristics (Johnson and Johnson). They are usually sold in pots or hanging baskets. The foliage plant category includes house plants for indoor or patio use and large specimen plants used for the interiors of hotels, restaurants, and offices. The major foliage plants include cacti, ferns, ficus, ivy, palms, schefflera, and philodendrons. Other foliage plants include crotons, fatsia, jade plants, Norfolk pines, spider plants, wax begonia plants, and yucca (see Appendix table 2).

### Potted Flowering Plants

Flowering plants are also produced for their decorative shape, size, color, and stem and leaf characteristics, and are usually sold in pots or hanging baskets for indoor use. Some examples of potted flowering plants that may be field grown for a period are anthuriums, azaleas, bromeliads, chrysanthemums, and orchids.

## The Field-Grown Floriculture Market

### Supply

U.S. domestic floriculture production had an estimated farm value of \$3.7 billion in 1993, up 56 percent from 1986 (Table 1). Wholesale cash receipts for floriculture products, including the value of imports, were estimated at \$6.1 billion in 1993, up from \$3.9 billion in 1986 (ERS estimate).

Although imports of floriculture products have trended upward in the last 8 years, they have remained a small share of domestic retail expenditures for floriculture plants. The U.S. imported \$466.1 million in floriculture products in 1993, an increase of about 63 percent from imports in 1986.

In 1993, about 82 percent of imported floriculture products were cut flowers, 7 percent were foliage plants, 6 percent were potted flowering plants, and 4 percent were cut cultivated greens. Major foreign sources of floriculture products are Canada, Mexico, the Netherlands, Costa Rica, Colombia, and Ecuador.

### Demand

U.S. retail purchases of floriculture plants have risen almost consistently since 1986 (Table 1). Consumer purchases totalled \$12.6 billion in 1993, up 47 percent from 1986. Retail expenditures for floriculture products were approximately \$36 per capita in 1986 and \$49 per capita in 1993.

The demand for floriculture products, especially the demand for cut flowers, is highly seasonal. Sales are greatest from February through May, and during the fall, and lightest during the summer. Sales of cut flowers peak around holidays, such as Valentine's Day, Easter, Mother's Day, Thanksgiving, and Christmas. Cut flowers and foliage plants, however, are becoming increasingly popular for everyday use and as all-occasion gifts.

The principal market outlets for the floriculture industry are garden centers, mass merchandisers, re-wholesalers, builders, landscape contractors, and other commercial businesses such as hotels, restaurants, and offices.

Demand for U.S. floriculture products in the international market has been declining since 1991. The U.S. exported nearly \$85.4 million of floriculture products in 1993, up from about \$72.1 million in 1986. Exports, however, declined \$7.6 million since 1990 (Table 1). About 2 percent of domestic production was exported in 1993.

Foliage plants accounted for 49 percent of total exports in 1993; cut flowers, 39 percent; cut florist greens, 12 percent; and potted flowering plants, 0.4 percent. The largest export markets are Canada, the Netherlands, Germany, Mexico, and Japan.

## Prices

USDA's National Agricultural Statistics Service (NASS) has conducted a survey of commercial growers in major floriculture states since 1976 to obtain data on prices. Based on these survey results, USDA reports average wholesale prices for the following floriculture crops:<sup>1</sup>

- 1) *Cut flowers*--standard and miniature carnations, standard and pompon chrysanthemums, gladioli, hybrid tea and sweetheart roses.
- 2) *Potted flowering plants*--african violets, florist chrysanthemums, finished florist azaleas, easter lilies, and poinsettias.
- 3) *Potted foliage; foliage hanging baskets.*
- 4) *Bedding plants*--geraniums, other flowering and foliar-type plants, and vegetable-type plants.

Weekly shipping-point prices for a number of ornamental crops are also available from Federal-State Market News Service annual reports, which are published by various state departments of agriculture. For example, the Federal-State Market News Service of the California Department of Food and Agriculture publishes an annual report, "Marketing California Ornamental Crops," which provides weekly shipping-point prices for various floriculture products.

## Industry Characteristics

Although they are a small proportion of all farms growing floriculture crops, farms with \$500,000 or more in agriculture product sales account for a large share of total floriculture output. A majority of the growers consider farming as their main source of income. However, about 40 percent of the growers, mostly those with small- and medium-size operations, supplement their farm income with off-farm employment.

### Farms Growing Foliage Plants

#### Farm Size Distribution

Ninety percent of the farms growing foliage plants had less than \$500,000 in agriculture product sales in 1987, while 44 percent had sales under \$25,000

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<sup>1</sup> A commercial producer of floriculture crops was defined as having \$10,000 or more in sales of cut flowers, cut greens, flowering and foliage plants, or bedding plants. The number of states surveyed and the number of crops included have been revised over time. The 1993 survey results, reported in USDA's Floriculture Crop report, provide data for 28 crops in 36 major floriculture states. Wholesale prices for some states are reported individually per product, while average wholesale prices for the 36 states are reported for each crop.

(Table 2). Farms with \$500,000 or more in sales, however, furnish the bulk of foliage plant production (Figure 1). The large farms accounted for 68 percent of gross farm receipts from foliage plant sales, and for 45 percent of field-grown output. Medium-size farms (\$100,000 to \$499,999 in sales) accounted for 26 percent of the field-grown acreage and 24 percent of foliage plant sales.

#### Type of Organization

Fifty-nine percent of the farms with foliage plants in 1987 were individually- or family-owned operations, and most were small- and medium-size farms (Tables 2 and 3). Twenty-nine percent of all the farms were organized as corporations, while 10 percent were structured as partnerships. Seventy-six percent of all large farms were corporate organizations.

#### Income Diversification

Nearly 50 percent of the \$1.2 billion in gross cash farm income from farms growing foliage plants in 1987 came from foliage plant sales. The remainder was from other crop and livestock sales (Appendix table 3a). In Florida, the number one foliage plant state, foliage plant sales accounted for 72 percent of gross cash farm income.

Fifty-four percent of all the operators on farms growing foliage plants identified farming as their main occupation in 1987 (Table 4). Thirty-nine percent of all growers, however, supplemented their income with off-farm employment. More than half of the growers with off-farm employment had foliage plant sales of less than \$25,000. For the growers who relied on off-farm income, 21 percent indicated that they worked off the farm 1-99 days during the year, and 79 percent worked off the farm for 100 days or more (Table 4).

### **Farms Growing Flowering Plants**

#### Farm Size Distribution

Ninety-two percent of the farms growing flowering plants in 1987 had less than \$500,000 in agriculture sales (Table 2). These small- and medium-size farms accounted for almost 52 percent of flowering plant acreage, excluding greenhouse acreage (Figure 2). Large farms, those with sales of \$500,000 or more, accounted for about 70 percent of flowering plant sales.

#### Type of Organization

In 1987, 62 percent of the farms with flowering plants were individually- or family-owned operations (Table 3). Corporate farming accounted for a quarter of all farms growing flowering plants, while partnerships accounted for 10 percent. The largest number of corporate-type farms were small-to-medium in size, but 76 percent of all large farms were also of this organizational type.

Table 2--Size distribution of farms growing floriculture crops in the United States, 1987

Farms Producing:	All farms	---- Total agriculture product sales ----				
		\$500,000 or more	\$100,000 to \$499,999	\$50,000 to \$99,999	\$25,000 to \$49,999	Less than \$25,000
	Number	-----Percent of farms-----				
Foliage plants	5,155	10	22	12	12	44
Flowering plants	6,405	8	22	13	14	43
Bedding plants	11,148	5	19	13	15	48
Cut flowers and cut greens	4,561	7	19	11	12	51

Source: 1987 U.S. Census of Agriculture.

Table 3--Farms growing floriculture crops: Organizational type in the United States, by sales class, 1987

Type of farm and organization than		Total agriculture product sales			
		All farms	\$500,000 or more	\$100,000 to \$499,999	\$50,000 to \$99,999
Farms producing foliage plants:					
Individual or family	3,060	78	438	372	
Partnership	529	41	154	89	
Corporation					
Family held	1,293	322	483	145	
Other than family held	178	56	67	17	
Other	95	2	10	10	
Farms producing flowering plants:					
Individual or family	3,992	78	600	504	
Partnership	660	46	187	121	
Corporation					
Family held	1,450	346	556	180	
Other than family held	177	49	62	17	
Other	126	1	7	15	
Farms producing bedding plants:					
Individual or family	7,744	110	987	979	
Partnership	1,138	55	306	188	

Corporation					
227	Family held	1,830	327	661	276
	339				
23	Other than family held	229	63	77	22
	44				
18	Other	207	2	10	17
	160				
Farms producing cut flowers and cut greens:					
383	Individual or family	3,157	46	404	308
	2,016				
73	Partnership	482	37	116	68
	188				
Corporation					
78	Family held	808	230	296	95
	109				
4	Other than family held	73	25	24	11
	9				
7	Other	41	0	5	7
	22				

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Source: 1987 U. S. Census of Agriculture.

Table 4--Principal occupation and number of days worked off the farm by operators of farms growing floriculture plants, by sales class and type of farm in the United States, 1987

Item \$25,000 Less and type than of farm \$49,999 \$25,000		----- Total agriculture product			
		All farms	\$500,000 or more	\$100,000 to \$499,999	\$50,000 to \$99,999
		----- Number of farms-----			
<u>Farming is main occupation</u>					
of farms growing:					
Foliage plants 802	2,802	404	848	408	340
Flowering plants 1,045	3,606	411	1,086	552	512
Bedding plants 2,227	6,324	451	1,597	1,021	1,028
Cut flowers and cut greens 1,133	2,895	300	721	380	361
		----- Percent of all farms-----			
Farms growing:					
Foliage plants 15.5	54.4	7.8	16.5	7.9	6.6
Flowering plants 16.3	56.3	6.4	17.0	8.6	8.0
Bedding plants 20.0	56.7	4.0	14.4	9.2	9.2
Cut flowers and cut greens 24.8	63.5	6.6	15.8	8.3	7.9
		----- Number of farms-----			
<u>Operator days off-farm</u>					
None for farms growing:					

Foliage plants	2, 836	375	835	412	326
888					
Flowering plants	3, 674	397	1, 479	562	499
1, 134					
Bedding plants	6, 014	446	1, 554	935	933
2, 146					
Cut flowers and cut greens	2, 421	267	631	317	307
899					
Any for farms growing:					
Foliage plants	2, 014	92	232	187	233
1, 270					
Flowering plants	2, 343	86	227	220	291
1, 519					
Bedding plants	4, 470	80	343	444	638
2, 965					
Cut flowers and cut greens	1, 836	54	155	123	194
1, 310					
1 to 99 days					
for farms growing:					
Foliage plants	416	28	76	43	61
208					
Flowering plants	536	32	74	65	82
283					
Bedding plants	1, 044	27	137	135	165
580					
Cut flowers and cut greens	424	23	49	41	52
259					
100 to 199 days					
for farms growing:					
Foliage plants	360	7	32	36	50
235					
Flowering plants	439	7	35	48	57
292					
Bedding plants	917	8	56	98	161
594					
Cut flowers and cut greens	403	4	26	18	46
309					
200 days or more					
for farms growing:					
Foliage plants	1, 238	57	124	108	122
827					
Flowering plants	1, 368	47	118	107	152
944					
Bedding plants	2, 509	45	150	211	312
1, 791					
Cut flowers and cut greens	1, 009	27	80	64	96
742					

Not reported for farms growing:					
Foliage plants	305	32	85	34	52
102					
Flowering plants	388	37	103	55	70
123					
Bedding plants	664	31	144	103	114
272					
Cut flowers and cut greens	304	17	59	49	44
135					

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Source: 1987 Census of Agriculture.

### Income Diversification

Farms with flowering plants reported a substantial amount of diversification with other agricultural products. Of the \$1.3 billion in gross cash farm income received by those farms growing flowering plants in 1987, about 50 percent came from the sale of other crops and livestock (Appendix table 3b). On farms in California, the leading producer of potted flowering plants, cash farm receipts from flowering plant sales accounted for 56 percent of gross farm income, while cash farm receipts from the sale of other crops and livestock accounted for 42 percent and 1 percent, respectively.

In 1987, 56 percent of the operators on farms with flowering plants identified farming as their main occupation (Table 4). About 37 percent of all growers, mainly growers with small-to-medium size operations, supplemented their income with off-farm employment. For those relying on off-farm employment, 23 percent indicated that they worked off the farm 1-99 days during the year, while 77 percent worked off the farm for 100 days or more (Table 4).

### **Farms Growing Bedding and Garden Plants**

#### Farm Size Distribution

Small-to-medium size operations dominate the U.S. bedding and garden plant industry. Only 5 percent of the farms growing bedding plants had sales of \$500,000 or more in 1987 (Table 2). Those farms with more than \$500,000 in sales, however, accounted for 60 percent of field-grown acreage of bedding plants (Figure 3), and about 57 percent of the U.S. total cash receipts from the sale of bedding plants (including greenhouse sales). Medium-sized farms (with \$100,000 to \$499,999 in sales) accounted for 22 percent of the field-grown acreage and 28 percent of bedding plant sales.

#### Type of Organization

About 70 percent of the farms growing bedding plants in 1987 were individual- or family-owned operations, of which 86 percent were operations having sales of less than \$100,000 (Table 3). Corporate farming accounted for 18 percent of all the farms, while partnerships accounted for 10 percent. Eighty-one percent of the corporate-type farms consisted of small-to-medium size farms (with \$499,999 or less in sales). About 70 percent of all large farms were corporate-type farms.

#### Income Diversification

Bedding plant sales accounted for 54 percent of the \$1.5 billion gross cash farm income received by farms growing bedding plants in 1987 (Appendix table 3c). Growers in California, the lead state in bedding plant production, received almost 74 percent of their gross cash farm income from bedding plant sales.

Fifty-seven percent of the operators considered farming their main occupation in 1987 (Table 4). Forty percent of the growers, mostly those having small-

to-medium size operations, supplemented their income with off-farm employment. Seventy-seven percent of the operators with off-farm employment worked off the farm for 100 days or more (Table 4).

## **Farms Growing Cut Flowers and Cultivated Cut Greens**

### Farms Size Distribution

The Census reported 4,561 farms producing cut flowers and cut greens in 1987 (Table 2). The vast majority of these operations reported less than \$100,000 in farm sales. The 7 percent of the farms with \$500,000 or more in sales, however, accounted for 45 percent of the total field-grown acreage and 69 percent of the value of farm sales.

### Type of Organization

Sixty-nine percent of the farms growing cut flowers and cultivated cut greens in 1987 were individually- or family-owned operations, and most were small-to-medium in size (Table 3). Three-quarters of the farms with sales of \$500,000 or more were reported as having a corporate organizational structure.

### Income Diversification

Seventy-seven percent of the \$770 million gross cash farm income received by farms growing cut flowers and cut greens in 1987 were from cut flowers and cut green sales. Twenty-one percent was from other crop sales, and 1 percent was from livestock sales (Appendix table 3d). In California, the leading state in the production of cut flowers and cut greens, 90 percent of the gross cash farm income was from cut flowers and cut green sales and only 10 percent from other sales.

The majority (64 percent) of operators considered farming to be their main occupation (Table 4). Forty percent of all growers, however, supplemented their income with off-farm employment. Most of those had small-to-medium size operations.

## **Major Production Areas for Field-Grown Floriculture Products**

### **Foliage Plants**

Although nearly all states produce foliage plants, production is concentrated in Florida, Texas, and California. Only these three states reported 1,000 acres or more of foliage plants grown in the open in 1992 (Appendix table 1b). These states' output accounted for 73 percent of the value of U.S. foliage plant output in that year. States reporting between 100 and 1,000 acres of production in the open in 1992 include Hawaii, Pennsylvania, Tennessee, Georgia, New Jersey, North Carolina, Illinois, and Oregon.

Florida's foliage plants accounted for about half of the nation's open-field acreage and 48 percent of foliage plant value. Texas ranked second in terms

of acreage in the open, with 12 percent of the U.S. total and 6 percent of the crop value, while California came in third, with nearly 10 percent of the acreage in the open and 19 percent of the U.S. crop value. Hawaii, the fourth leading state in foliage plant production in 1992, had 9 percent of the U.S. foliage plant acreage in the open, and accounted for about 3 percent of crop value.

### **Potted Flowering Plants**

Potted flowering plants are also produced widely in the United States, with nearly all states reporting production (Appendix table 1c). California is the largest producer of potted flowering plants. California growers accounted for 11 percent of total U.S. potted flower acreage in the open in 1992, and 16 percent of the total crop value.

Among the southern states, Florida, North Carolina, Texas, and Georgia are the major flower-growing states. These four states each reported at least 150 acres of flowering plants in the open, and together accounted for 22 percent of the total crop value. Other important states in potted flowering plant production are New Jersey, Illinois, Michigan, and New York.

The potted flowering plant category is the only flowering plant grouping reported by the Census. The Census provides information on production "under glass or other protection" or "in the open." No separate data are available for "in-ground flowering plants." However, some potted flowering plants were grown in-ground and transferred to containers, while others were grown in containers throughout their life cycle.

We believe that a large portion of the acres in the open reported by the Census for potted flowering plants may be attributed to the production of chrysanthemums. Chrysanthemums are more likely to be grown in-ground for a portion of their production cycle than certain other flowering plants.

### **Bedding Plants**

Almost all states produce bedding plants, but the majority of U.S. production is from the southern and western states. In 1992, about 72 percent of the U.S. crop grown in the open, and over half of the cash farm receipts from bedding plant sales, were from these two regions (Appendix table 1d). The acreage in the open reported by the Census for bedding plants refers to plants grown mainly in flats or tray packs.

California, Georgia, and Texas were the only states that had at least 1,000 acres of bedding plants grown in the open. These three states accounted for about 46 percent of the 13,816 acres devoted to bedding plant production in the open during 1992, and about a quarter of the U.S. crop value. The top five bedding-plant producing states based on value of production in 1992--California, Michigan, Texas, Florida, and Ohio--accounted for nearly 45 percent of U.S. bedding plant sales.

### **Cut Flowers and Cut Cultivated Greens**

California and Florida account for over half of U.S. cut flower and cut green production. Combined, the two states accounted for more than 60 percent of both acreage in the open and crop value in 1992 (Appendix table 1e). Florida ranked first in terms of acreage, while California ranked first in terms of plant sales.

Other states that had at least 1,000 acres of cut flowers and cut greens in the open were Michigan, Hawaii, Washington, and New Jersey. The value of output in these four states amounted to \$78.8 million, about 12 percent of the U.S. total. Almost all of the cut flowers and cut greens grown in the open are grown in-ground.

## **Cultivation and Management Practices**

### **Climatic Requirements**

Temperature influences photosynthesis and respiration and, therefore, affects the rate of plant growth. Most ornamental foliage plants are tropical and do not tolerate freezing temperatures. Foliage plants may begin to show signs of slow growth or plant damage as temperatures reach 90° F and above, or as they drop below 50° F. Additional problems may occur as temperatures rise to above 100° F to 110° F (McConnell).

Most bedding plants germinate at temperatures of about 70° F (Appendix table 4a). Cool evenings and warm days promote good size and foliage color in bedding plants (Behe).

Hot, humid weather is an often-cited barrier for cut flower production. Many varieties do not bloom at all or are of poor quality during hot weather, especially when night-time temperatures remain high.

USDA's plant hardiness zones represent areas with different average annual minimum temperatures. Since these zones reflect typical conditions, they are used as a guide to determine feasible areas for plant production. However, many other factors, including unpredictable weather, are likely to affect a plant's ability to survive in a particular zone. Growing plants at the top or bottom of their temperature range is risky, as they may fail to thrive (Mackey, et al.).

### **Soil Requirements**

Floriculture crops can be produced on many soil types, but a fertile soil with good drainage and good aeration is ideal. Most cut flowers grow best if there is some organic matter in the soil. For a few species, such as most wild flowers, ferns, alpine plants, and desert plants, a less fertile soil is best. Poor aeration can reduce plant growth or kill the plant by restricting the absorption of water and nutrients by the roots (Poole and Conover).

### **Planting Practices**

Planting floriculture crops is a labor-intensive operation. The majority of foliage and flowering plants, including those grown for cut flowers and cut florist greens, are vegetatively propagated from cuttings of plant parts such as stems, roots, and leaves. The type of cutting depend on the plant specie. However, the most common vegetative propagation method uses stem cuttings. In addition, a few species are propagated from seed (Appendix table 4b). In some cases, foliage plants may be established from tissue culture plantlets (McConnell).

Annual varieties of cut flowers should be planted in the field as soon as the danger of frost is past. Earlier flowering occurs if transplants are used as field liners. Transplants should be sown 4-6 weeks prior to the planting date and grown in a greenhouse or cold frame to hasten development. Biennials should be planted in the fall to ensure adequate cold treatment before growth starts in the spring. Most biennials require a cold treatment to induce good, uniform flowering (Wilkerson).

Most cut flowers grow best in full sun on fertile, well-drained soils, where early- or late-season frosts are unlikely. For tall plants, wind protection is necessary. Also, most cut flowers require some form of crop support, such as a 4" open wire or nylon mesh net to reduce breakage and the likelihood of dirty flowers, crooked stems, or poor floral display. Fencing may also be necessary to prevent animal damage (Wilkerson).

In the case of bedding plants, the most popular methods of propagation include conventional seeds, high-germination seeds, and plugs (Behe). Conventional seeds are untreated seeds that have good germination rates and that produce salable plants. High-germination seeds have faster and more uniform germination rates, but are more expensive. Plugs are small seedlings, often the size of a bottle cork, with several true leaves and a well-developed root system.

As the name suggests, plugs are ready to be "plugged into" a pot or cell pack to produce a mature plant in an average of 3 to 5 weeks (Behe). Mechanical transplanters and robotic-type equipment have automated the plugging process in bedding plant production, but most growers still transplant by hand (Behe).

### **Fertilization**

Fertilizer needs vary by plant specie and variety. Some plants tolerate a wide range of fertilization, while others require specific applications. For example, annual flowers usually need more fertilizer than perennial flowers, ornamental grasses, and herbs (Mackey, et al.).

Generally, high rates of fertilization are applied during the plants' early stages of growth, with low rates applied prior to harvest. For most crops, frequent light fertilizer applications are better than heavy single feeds (Mackey, et al.). Clay soils usually require lower application rates because of their greater nutrient-holding ability. Sandy soils require more frequent applications because they leach more readily.

## **Irrigation**

The irrigation needs of different floriculture crops also vary according to plant specie and variety. Some plants require irrigation daily, while others must be watered as infrequently as once every one or two weeks. Water is essential for plant nutrition and temperature control. Aside from dissolving and carrying nutrients to the plant, water is used to protect cold-sensitive plants from frosts and to refresh wilted plants, particularly bedding plants, during hot weather when temperatures are above 90° F (Mackey, et al.).

Water in the soil and plants evaporates quickly during hot, bright, or windy days. Plants should therefore be irrigated in the early mornings or late evenings to limit evaporation. Generally, water should be applied deeply into the root zone, but not too frequently. The soil should be slightly damp but not wet.

Improper watering is one of the major causes of reduced plant quality and yield (Poole and Conover). Over-irrigation is wasteful of both water and fertilizer and contributes to disease problems. Under-irrigation puts unnecessary stress on plants, resulting in reduced plant vigor, lower flower yields, and poor quality (University of Hawaii).

A fine mist or gentle spray, usually from a sprinkler-type or overhead system, rather than a hard stream of water, reduces the likelihood of runoff and damage to the plants (Mackey, et al.). However, overhead watering systems are not recommended for most field-grown cut flowers because they promote the spread of disease and can cause floral damage (Wilkerson). Trickle irrigation systems are available which supply water without waste, and are recommended for watering cut flowers.

## **Harvesting Practices**

Field-grown foliage and flowering plants such as sansevieria, ficus, dracaena, ti-leaf, and some chrysanthemums may be dug up and transferred to containers at some point during production. The plants are most commonly hand dug to reduce damage. The plants continue to grow in the containers until an order is received from a buyer. Plants are usually placed in boxes for shipping and may be tied around their canopy to reduce damage.

When harvesting cut flowers and cut cultivated greens, the individual stems with flower(s) or foliage are separated or cut from the plant. The general harvesting procedure is very similar for both cut flowers and cut greens.

Cut flowers are harvested when the buds have just begun to open. Stems with more than one flower, such as statice and gladiolus, are usually harvested when less than 1/3 of the flowers have fully opened. Some plants, such as achillea, can be harvested at any time the flower head is fully expanded (Wilkerson).

Harvesting flowers early in the day is recommended to prevent buildup of field heat within the bunches. Cut stems should be immediately placed in lukewarm water containing a floral preservative. The preservative solution replaces the flowers' supply of water, sugar, and other nutrients that it was denied when harvested. The stems are left in water for at least 2-3 hours before sale or grading to allow for a maximum amount of water uptake. Postharvest treatment of recently-cut stems with 1000 ppm silver nitrate for 10 to 20 minutes, or waxing flowers with 3 percent carnauba wax, increase flower life following cutting (Paull).

The cut flowers and greens can be stored in coolers at 40° F temperatures overnight for later grading and storage, or they can be left out in a cool location, usually at temperatures less than 80° F. They are graded by stem length at 2-6 inch intervals, and can be downgraded due to broken stems, poor flower condition, poor foliage condition, or old flowers (Wilkerson).

### **Packing and Shipping Floriculture Plants**

Trucking is the most popular method for transporting floriculture plants. Refrigerated tractor-trailers, trucks, and vans are preferred for shipping because temperatures can be controlled in the cargo space. Non-refrigerated carriers can be used for short hauls, but close attention to temperatures are required to avoid overheating.

To reduce the risk of product damage, ornamental plants are generally not packed tightly together, and many are boxed and placed on special racks or shelves. Shipments are measured in volume, assumed to approximate the cubic capacity of the vehicle, rather than weight. "Truckload" is used as a standard unit equivalent to the volume of a 45-foot-long trailer (Rahmani, et al.).

Air shipment, made by air mail, air post, and air freight, is also a popular mode of shipping, especially for cut flowers. However, a major problem in air-shipping flowers is exposure to temperature extremes. Flowers can be damaged when exposed to temperatures of less than 50° F for more than one day. Cut flowers are bunched and packed in boxes to reduce the risk of injury during shipping. The standard size for flower boxes is 39" by 21" by 7" (Paull).

## **Marketing Practices**

### **Marketing Outlets**

Foliage and bedding plants are sold mostly to re-wholesalers, garden centers, mass merchandisers (supermarkets and chain discount stores), retail florists, and landscapers. A broker may facilitate the sale between the grower and the buyer, or growers may sell directly to retail markets. Brokers arrange for transportation, but they do not take possession of the product.

Fresh cut flowers move from growers to retail outlets in many ways. Growers can sell their flowers to a shipper, or ship themselves. Shippers buy flowers from other domestic growers and overseas suppliers for resale to various outlets. Some small growers sell their products directly at farmers' markets or roadside markets, or through pick-your-own operations. Cut flower shippers are more common on the West Coast, while traditional wholesalers dominate the East Coast markets (Texas Department of Agriculture).

Mass merchandisers or volume buyers, particularly supermarkets, are rapidly increasing their share of the market for floriculture products, especially cut flowers. About 80 percent of the nation's supermarkets now sell cut flowers, potted plants, bedding plants, and other floral items (Texas Department of Agriculture). Potted foliage plants (including those in hanging baskets) are also now available in most supermarkets.

Supermarkets purchase about 45 percent of their cut flowers from shippers or wholesalers, an almost equal amount directly from domestic flower growers, and about 10 percent from overseas suppliers (Texas Department of Agriculture). Foliage and bedding plants are supplied mostly by local growers.

Contractual arrangements with cut flower growers are becoming popular among supermarkets who sell floral products. Popular floriculture items sold in supermarkets include roses, carnations, and small arrangements. Loose, single stem fresh flowers are the least popular.

### **Price Determination**

Flowers are usually priced in one of three ways: standing order sales, spot market sales, and consignment sales (Texas Department of Agriculture). Standing orders, the most commonly-used pricing method among domestic growers and importers, are sales made at fixed prices (based on market demand and the cost of production of the preceding year). Increasingly, however, wholesalers are shifting to spot market sales, as high-quality imports are available year-round through spot markets.

Spot market prices fluctuate daily. They typically fluctuate around fixed standing order prices, with spot sales receiving higher prices than standing order prices during peak periods.

Consignment sales usually occur when a shipper or importer takes a grower's flowers for a 20-25 percent commission (Texas Department of Agriculture).

## **Costs of Production**

The largest expense item in floriculture crop production is labor. Labor costs (both hired and contract work) averaged about 26 percent of total costs for farms growing bedding plants and potted flowering plants in 1987, 29 percent for farms growing foliage plants, and about 30 percent for farms growing cut flowers and cut cultivated greens (Appendix tables 5a-d). Further information on production costs, including detailed budgets, are presented in Appendix tables 6a and 6b.

## **Production Perils**

The major production perils confronted by in-ground floriculture producers are excessive rain, high winds, and freezing temperatures. The extent of insect and disease problems varies by geographic area, and is discussed in greater detail in the "State Analyses" section.

### **Excessive Rain**

Excessive rainfall can flood fields and kill plants by suffocating the roots. It can also cause other problems, such as root rot, weed invasion, and foliar disease problems. Heavy rains can also wash out plants, exposing their roots to drying or freeze damage.

If excessive rain does not kill the plant, it may diminish vigor and make the plant unsalable by reducing quality. Excessive rain can also delay harvesting of cut flowers and cut greens, and the marketing of all floriculture products.

### **Excessive Heat**

Excessive heat for a lengthy period of time can cause wilting, slow growth, leaf scorching, and insect problems. When windy conditions accompany high temperatures, plants lose water more rapidly than it can be replaced through the roots. Hence, wilting and scorching become more severe. All these problems result in lower-quality plants.

Overhead watering or other irrigation systems are used to refresh the plants. Spraying the leaves with a liquid plastic before periods of excessive heat also helps prevent scorching (Pirone).

### **Drought**

Wilting is the first symptom of drought stress. Early drought conditions can be mitigated as long as irrigation is available. However, sudden, unexpected heat accompanied by extended drought can dry out water sources (ponds, wells, streams, lakes) and cause serious crop losses. A prolonged drought can result in serious crop damage.

**Excessive Wind**

Very forceful winds (such as caused by Hurricanes Andrew, Hugo, or Iniki) can cause serious crop damage. They can uproot in-ground plants and break plant parts, rendering them unsalvageable. Forceful winds can also topple plants in containers, break plant containers, or destroy greenhouse structures and shade houses.

**Hail**

Large or excessive hail can puncture holes in the leaves or strip the plant of most of its leaves or flowers, rendering the plants unusable or causing total loss.

**Low Temperatures**

Extremely low temperatures can cause slow growth and stunting of plants, and freezing temperatures may even kill the plant. Late spring frosts can kill new growth and buds, slow growth, and deform plants, reducing their quality or making them unsalable.

**Fire**

Fire can be a problem, particularly in California and other western areas that are prone to brush, grass, or forest fires. Farms in isolated areas near woodlands or forests bear a high risk of loss due to fire. Fires are often started by natural acts such as lightning, but can also be caused by arson or negligence.

**Air Pollution, Contaminated Water or Chemical Sources**

Air pollution, particularly in urban areas, can cause leaves to wilt and drop. Water supplies can also be contaminated by excessive soluble salts, salt water intrusion, or other contaminants.

**Mechanical and Chemical Damage**

Mechanical damage can occur because of the misuse of equipment or machinery, or by vandalism or theft. Workers can miscalculate usage rates or misapply chemicals, resulting in damage or the total loss of trees and plants.

Symptoms of chemical injuries may range from minor leaf speckling to death of the plant, but the most common symptoms are chlorosis (a condition that causes the plant to turn yellow), burning, stunting, and reduced leaf size. The practice of tank-mixing pesticides and fertilizers can prove injurious to plants, as can the application of pesticides during adverse weather. In addition, over-fertilization can decrease the quality of many floral crops (Paull).

Under certain conditions, plants may be severely damaged by spray materials (particularly pesticides and fungicides), especially tender, succulent growth. Damage is usually greatest when the soil is dry and the plants are wilted.

Such chemical damage can vary depending on climatic conditions. Bordeaux mixture and other copper fungicides that are applied during cool, damp weather may cause leaf burning or spotting, with roses among the most susceptible to damage. Further, the application of dinitro compounds and sulfur when the temperature is above 85° F may result in severe damage to flowers and leaves of many plants. The leaves of such evergreens as Cryptomeria, Douglas-fir, hemlock, and yews may be injured by some kinds of dormant oil sprays (Pirone).

In order to minimize the chances of plant damage, pesticides should be applied during the cooler part of the day. Application should be made in the early morning so that the foliage will be dry before temperatures reach 80° F to 90° F (Short and Mizell).

### **Diseases**

Virtually all floriculture crops are subject to disease losses. Common diseases include blotch, blight, rots, smuts, mildews, anthracnose, wilt, and damping-off. Damage may range from temporary leaf spots to death of the plant. Diseases often are transmitted by pests such as aphids, mites, and other insects.

While most parasitic plant diseases are caused by fungi, viral diseases are among the most destructive. Viral diseases often kill infected plants (Pirone).

### **Insects and Animal Pests**

Floriculture crops face a wide variety of insect and animal pests. The most common pests include grasshoppers, ants, chinch bugs, lace bugs, Japanese beetles, leafhoppers, whiteflies, aphids, mealybugs, and thrips. Among the most common animal pests are voles, mice, rabbits, deer, and birds.

The most apparent insect damage results from feeding activity. Thrips, for example, rasp or shred plant tissues to start the flow of sap. They feed mainly on the buds, flowers, and developing foliage of bedding and foliage plants, producing malformed leaves and flowers that have a streaked appearance (Short and Price). Aphids, scales, mealybugs, and whiteflies suck plant sap, causing leaves to curl or crinkle, flower buds to harden, and flowers to become distorted. Mites also suck plant juices. Aside from their feeding, the sucking insects frequently transmit viral diseases, which can cause greater damage than the feeding activity.

Various nematodes attack floral plants. They are microscopic eelworms that feed in intercellular spaces, resulting in cell disintegration. Nematodes cause swelling of the stems, irregularities in branching, deformation of leaves, suppression of blossoms, and galls on the roots (Pirone).

The appropriate control method depends on the insect's growth stage and the manner by which they inflict damage. Chewing insects are most easily controlled by contact insecticides while sucking insects, mites, and thrips are controlled with either contact or systemic materials (Short and Mizell).

Integrated Pest Management (IPM) practices are recommended for insect control. IPM involves the use of intensive management along with chemicals to manage insects and diseases. Some examples of IPM practices include: using pest-free seeds, cuttings, or plants in production areas; applying irrigation water at the soil surface; controlling weeds; and eliminating pest-infested plants or plant parts (Short and Mizell). These practices help in reducing the incidence of insect infestations and disease infections. IPM also involves intensive monitoring of insects and the application of insecticides only when populations reach an economic threshold.

### **Weeds**

Weeds not only compete with the crop for space, water, light, and nutrients, but they also harbor insects and diseases. Weeds are classified as grasses, broadleaves, or sedges, and can further be distinguished by the length of their life cycle. Common grass weeds are crabgrass and annual bluegrass, while common broadleaf weeds are creeping charlie, spurge, burning nettle, and sicklepod. Yellow and purple nutsedge are examples of sedges (Ingram and Currey).

## **State Analyses**

### **California**

California is the leading floriculture state. The Census reported 2,210 farms in California with floriculture crops in 1992, having \$797.1 million in sales. Over one-fourth of these farms were in San Diego county. The counties with at least 100 farms include Los Angeles, Monterey, Santa Clara, Santa Barbara, Ventura, and Santa Cruz. San Diego and Monterey counties reported the largest floriculture crop sales, with \$159.6 million and \$108.6 million, respectively. Their combined sales represented about 34 percent of the total value of California's floriculture production.

Cut flowers and cut florist greens are the largest segment of California's floriculture industry. According to the Census, this particular segment accounted for 39 percent of the state's total floriculture sales in 1992, followed by bedding plants (29 percent), potted flowering plants (17 percent), and foliage plants (15 percent). California's cut flower and cut green sales accounted for 49 percent of the U.S. total for cut flowers and cut greens.

### Grower Practices

The majority of California's cut flowers and cut florist greens are grown in-ground, without protective structures (Wick). The remainder of California's ornamental plants, as well as some bedding plants, are grown in greenhouses.

Plastic is the most popular protective material used in greenhouses. Shade-cloth structures are not very common.

Growers rely mostly on manual labor for their planting and harvesting activities. The only activity that is highly mechanized pertains to the seeding of bedding plants. Seeding is the most popular method of establishing bedding plants, while vegetative propagation through cuttings is most common for other ornamental crops. All of California's floriculture farms are irrigated (Wick).

Growers in southern California usually sell ornamental plants (except trees and fruit trees) and bedding plants in February, March, April, May, October, and November (Wick). Peak shipments for flowers generally coincide with traditional holidays, such as Valentine's Day, Mother's Day, Easter, Thanksgiving, and Christmas (California Department of Food and Agriculture). Weddings also increase the demand for flowers during May and June.

The bulk of flower sales are made to wholesale distributors who then sell to retail florists. Bedding and foliage plants are usually sold to retail garden centers. Most floriculture plants are delivered by truck, except for cut flowers and cut florist greens, which are usually shipped by air. California's cut flowers are shipped to buyers around the world.

Texas is the largest domestic importer of California's floriculture products. Other major out-of-state shipments go to Georgia, Ohio, Pennsylvania, New Jersey, Tennessee, and Alabama (Wick).

Nursery stock undergo mandatory plant health inspection. In fact, California has the largest number (about 700) of state nursery inspectors in the country.

#### Production Perils

Freezing temperatures, flooding, and air pollution are the major production perils in California. A hard freeze in late December of 1990 caused extensive damage to field-grown ornamental plants, with some of the damage extending into 1991 (California Department of Food and Agriculture). Temperatures dropped into the teens in many flower-growing regions, causing losses to outdoor crops and many broken pipes and valves. The damage to greenhouse crops was not extensive, except in isolated cases, but growers confronted much higher fuel costs.

Occasionally, floods can be a problem for floriculture growers, especially in the southern and central California coastal areas (Wick). The winter/spring of 1994/95 was particularly notable for floods in these areas. State losses for cut flowers, turfgrass, and other greenhouse/nursery crops totalled \$14.7 million (California Department of Food and Agriculture).

Plant damage due to air pollution occurs occasionally, especially on farms near urban areas, such as Los Angeles. Insects and diseases are not a great threat in California, particularly if growers follow prudent pest management practices.

### Demand for Crop Insurance

Most in-ground floriculture producers would likely buy catastrophic coverage because of its nominal cost. The greatest demand for buy-up coverage is expected to come from flower growers in the coastal counties of southern and central California. Growers in these areas are the most likely to experience losses due to excessive rain and they have an experience of losses due to winter freezes (Wick). Growers in counties outside the southern and central coastal counties face relatively few natural perils.

Ad hoc disaster payment data for 1988-1993 indicate that California's cut flower and cut green growers received 28 percent of the U.S. total payments made for those crops, and reported 30 percent of the acreage in the open (Appendix table 7d). These payments, however, represented only 0.11 percent of the crop value during this period, compared with 0.19 percent for the U.S. as a whole (Appendix table 8d). The ad hoc disaster assistance data include payments made for both in-ground and containerized losses.

### **Florida**

Florida leads the U.S. in foliage plant sales, and is just behind California in sales of cut flowers, cut greens, potted flowering plants, and bedding plants. In 1992, the state's floriculture industry was comprised of 2,741 farms, with a total crop value amounting to \$571.3 million (Census of Agriculture).

Although floriculture production is present in all Florida counties, output is concentrated in Dade, Orange, Palm Beach, and Volusia counties, all in the eastern portion of the state. These four counties each reported at least 200 floriculture farms in 1992, and combined they accounted for 61 percent of the state's sales. Other counties that reported at least \$10 million in floriculture sales include Lake, Manatee, Hillsborough, and Putnam.

Half of the state's floriculture sales in 1992 were foliage plants. About 83 percent of the foliage plant sales were from farms in Dade, Orange, Palm Beach, Lake, and Volusia counties. Cut flowers and cut florist greens accounted for 18 percent of Florida's floriculture sales; bedding plants, 16 percent; and potted flowering plants, 14 percent.

### Grower Practices

Production practices vary across the state and by type of floriculture crop. For instance, growers in Apopka County, located in central Florida, raise most of their foliage plants in greenhouses. In south Florida, growers first plant foliage plants in the ground and later transfer them to containers set in shade houses.

The time at which plants are transferred to containers depends on the specie. Ficus plants, for example, can be transferred to containers when they reach 8 feet, the height usually desired by homeowners. Some can be grown to 30 or 40 feet when used for hotel and office lobbies or shopping malls. The only

foliage crop grown in the field from start to finish and under full sun is the Sansevieria, which has an underground stem and is propagated through cuttings (McConnell).

Foliage plants are kept in containers and shade houses until a purchase order arrives. As the plants increase in size, growers may need to transfer them to larger containers, which is an added cost. Sometimes, growers discard plants rather than incur the added cost for new containers, particularly if market conditions are expected to remain unfavorable for an extended period of time (McConnell).

Planting and harvesting are labor-intensive operations. Robotic equipment for transplanting plugs of bedding plants has recently become available, but these machines remain unpopular among bedding plant growers, perhaps due to the ready availability of relatively cheap labor.

All farms growing floriculture crops in Florida have irrigation (McConnell). For the farms growing cut flowers, most use trickle irrigation (Harbaugh).

Floriculture crops are sold year-round, but peak sales usually are in the spring, while July and August are the months with the fewest sales. Cut flower and potted flowering plant sales are particularly heavy during holidays (McConnell).

Florida ornamental crops are transported interstate using various vehicles, ranging from small vans to full-sized tractor-trailers. Full-sized tractor-trailers (over 38 feet), equipped to control the temperature of the cargo space, are the most dominant type of vehicle (Rahmani, et al.). About 50 percent of the cut flowers, potted flowering plants, and bedding plants produced in Florida are shipped via refrigerated trucks (Harbaugh). Cut flowers and potted flowering plants are generally packed in boxes, while bedding plants grown in flats are placed on racks or pallets in trucks.

A large portion of Florida's cut flowers, potted flowering plants, and bedding plants are sold directly to mass merchandisers and garden centers. Some are sold to wholesalers, while a few are sold through roadside markets (Harbaugh). Foliage plants, particularly in south Florida, are generally sold through a broker (McConnell).

#### Production Perils

The major production perils faced by Florida growers include storms and freezes. Hurricane Andrew in 1992, a 1989 freeze, and a 1993 rain storm are recent examples of such perils (Frost). Hurricanes, particularly in the Coastal counties, can damage leaves, uproot plants, and destroy shade houses (McConnell). Hail storms also can cause plant damage. Foliage plants are particularly susceptible to chill injury when there is a sudden drop in temperature to below 45° F (McConnell).

Flooding caused by hurricanes or other rain storms can cause losses (Harbaugh). Drought is not a threat because all floriculture farms are irrigated.

Insects and diseases are always a potential problem because of the generally year-round hot and humid climate in Florida. While insect and disease problems appear to be kept at a minimum through prudent management practices, problems are still greater than those on farms in most other areas of the country (Harbaugh).

#### Demand for Crop Insurance

Most growers would likely participate in the catastrophic coverage portion of an in-ground crop insurance policy because of the low cost of participation. In addition, there is likely to be a substantial amount of interest in purchasing buy-up coverage for floriculture crops, especially after the bad experiences brought by Hurricane Andrew and recent hail storms (McConnell).

The most interest in the buy-up insurance is likely to occur among growers in the Coastal counties, especially Dade County. This is because the threat of hurricane and wind damage is greater in the coastal counties than in interior counties. Between 1988 and 1993, growers in Dade County received \$4.4 million in disaster assistance for foliage plant losses, and \$170,500 for cut flowers and cut cultivated green losses.

#### **Hawaii**

Hawaii's nearly ideal climate for raising floriculture crops, especially exotic flowers and tropical ornamentals, has earned the state an important place in the U.S. floriculture industry. Hawaii ranked fourth among all states in terms of the number of farms and floriculture acreage.

Hawaii reported 1,352 farms growing floriculture crops in 1992, with \$66.3 million in sales. Over three-fourths of the state's floriculture sales were attributed to cut flowers and cut florist green sales (55 percent) and foliage plant sales (24 percent).

Floriculture production is spread throughout the state, but Hawaii County reported 56 percent of the state's floriculture sales in 1992. Other important counties include Honolulu County, 29 percent; Maui County, 13 percent; and Kauai County, 2 percent. Sixty-eight percent of Hawaii's cut flower and cut green sales and 51 percent of their foliage plant sales came from Hawaii County.

#### Grower Practices

There are very few traditional greenhouses in Hawaii (Iwata). A number of in-ground floriculture crops are grown under fiberglass protection, but the structures do not have side protection. There are also a number of in-ground plants grown under shade cloth.

Some tropical flowers and almost all dracaena (for stock production) are grown in-ground under full sun (Leonhardt). Most farms growing floriculture crops in Hawaii, especially those growing flowers, have irrigation systems, except for those in high rainfall areas.

Based on value of sales, orchids are the most important floral crop grown in Hawaii (Table 5). Orchids are sold as cut sprays, cut blossoms, flowers for leis, and potted plants. Dendrobium is the most extensively-cultivated orchid, accounting for 75 percent of the state's orchid acreage (Leonhardt and Halloran).

Hawaii's climate is favorable for growing a number of foliage plants commonly used for interiorscaping on the mainland, and quality plants can be produced within a relatively short period. Growers protect their foliage plants from sun scorch by growing most of them under a shade cloth. Dracaena and palms have become the state's major export foliage crops (University of Hawaii).

Most of Hawaii's tropical flowers (anthurium, dendrobium orchids, and proteas) are shipped to the U.S. mainland (Leonhardt). Except for anthuriums, Hawaii exports only a small percentage of their tropical flowers to Japan, Europe, Canada, and other foreign markets (University of Hawaii).

Most of Hawaii's foliage plants are shipped to West Coast wholesale growers and are usually marketed through foliage plant brokers. Plants are shipped in individually-packed containers or containers packed with boxes of plants. Standardized boxing is not used due to the diversity of products and the variety of shipping methods available.

About half of Hawaii's cut flower production is sold to floral shippers, who sell to wholesale florist on the U.S. mainland. Virtually all are shipped by air (Paull). Smaller growers frequently sell directly to local retail florists (University of Hawaii).

The time required to ship foliage plants to the mainland can be 2 weeks or longer. This lengthy transit time often causes leaf deterioration, which forces buyers to hold the plants for 2 to 8 weeks for recovery prior to resale. The shorter transit time allowed by air shipment insures that plants will arrive in better condition. However, growers are restricted by the number of direct mainland flights, the size limit of plants for shipment, and increasing freight rates (University of Hawaii).

#### Production Perils

Tropical storms are the major threat to Hawaii's floriculture industry. In 1993, Typhoon Iniki struck Kauai, causing severe crop losses. That storm did not affect the Island of Hawaii, however, which accounts for about half of the state's floriculture production. Flooding is also a threat associated with tropical storms. Excessive rains may cause crop damage and promote disease development (Iwata). Insects can become a problem during very dry weather.

Table 5--Value of Hawaii's floriculture crops and market share,  
1989

Crop	Value of Sales	Share of Total Sales
	1,000 Dollars	Percent
Anthurium	7,811	23
Dendrobium	5,667	16
Other Orchids	4,275	12
Tropicals	4,023	12
Carnation	1,660	5
Protea	1,184	3
Other flower	9,816	29
Total	34,436	100

Source: Leonhardt and Halloran.

Diseases of major significance to the anthurium industry in Hawaii include Anthurium blight, bacterial blight, and anthracnose. Nematodes have also been a problem (University of Hawaii).

Dendrobium decline, root rots, and damping off are the most important problems of dendrobium orchids. These problems, particularly bacterial blight, have forced some farmers out of production. Good cultural practices and high levels of sanitation help control these disease problems.

#### Demand for Crop Insurance

Commercial growers will likely participate in the catastrophic insurance policy for in-ground floriculture crops because of its low cost. In addition, there is likely to be moderate interest in buy-up coverage. Damage caused by typhoons is always a threat. Cut flower growers will probably be the most interested. Hawaiian growers of cut flowers and cut cultivated greens collected nearly \$1.4 million in ad hoc disaster assistance payments between 1988 and 1993. This amount accounted for 23 percent of the total U.S. payments made for those crops (Appendix table 7d). Hawaii's ad hoc disaster assistance payments for cut flowers and cut greens amounted to 0.84 percent of the value of the state's cut flower and cut green production over the period.

#### **New Jersey**

The Census of Agriculture reported 863 farms growing floriculture crops in New Jersey in 1992, with \$86.6 million in sales. Bedding plants and potted flowering plants each accounted for 38 percent of total floriculture crop value, foliage plants accounted for 13 percent, and cut flowers and cut florist greens accounted for 11 percent.

Floriculture production is spread across New Jersey, but nearly 40 percent of the state's sales come from Middlesex, Morris, and Monmouth counties in the northeastern portion of the state. Other counties with more than \$6.0 million in floriculture crop value in 1992 were Gloucester and Cumberland, both at the southwestern tip of the state.

#### Grower Practices

Bedding plants are the most widely grown floriculture products in New Jersey (Durkin). With the exception of a small amount of gladiolus and cut flower acreage, most floriculture crops are produced in containers inside greenhouses or other protective structures (Durkin). Structures using shade cloth are not commonly used in New Jersey. Virtually all of the floriculture farms in New Jersey are irrigated (Durkin).

Floriculture sales, particularly of bedding plants, occur mostly between mid-April to about July 1. The peak sales period is in May. Homeowners are the main driving force for the floriculture business in New Jersey.

The important markets for New Jersey-grown bedding plants include the New York suburban area, Virginia, central Connecticut, Detroit, and Canada. Marketing

outlets for floriculture products vary according to the size of the farm operation. Small operations tend to sell to roadside or local markets, while large operations sell mostly to wholesalers, re-wholesalers, or mass merchandisers. Cut flowers, a very small segment of the New Jersey industry, are most sold locally (within 40 miles of the farm). They are usually marketed directly to retail florists, especially by those growers who have very small acreages (Durkin).

#### Production Perils

Drought and early frost are the major perils confronted by growers of in-ground plants in New Jersey. In addition, heavy snows and freezes can cause protective structures to collapse.

#### Demand for Crop Insurance

There probably would be very little interest in multiple-peril crop insurance for field-grown floriculture crops in New Jersey because very few growers have in-ground production.

The small amount of disaster assistance paid to New Jersey growers between 1988 and 1993 provides further evidence of the limited demand for insurance. Ad hoc disaster assistance payments to New Jersey bedding plant and cut flower/cut green growers totaled only \$18,900 and \$26,700 over that six-year period (Appendix table 7c and 7d). These payments represented 0.01 and 0.06 percent of the state's value of production (Appendix tables 8c and 8d).

#### **North Carolina**

The total value of floriculture crop production in North Carolina was \$99.1 million in 1992 (Census of Agriculture). Floriculture crops were grown by 801 farms on 17.75 million square feet of land under protective cover and 1,111 acres in the open in 1992. About 44 percent of total floriculture crop sales in 1992 were potted flowering plants, 38 percent were bedding plants, 15 percent were foliage plants, and only 4 percent were cut flowers and cut florist greens.

North Carolina counties with at least \$1.0 million in floriculture crop sales in 1992 were Mecklenberg, Rowan, Buncombe, Wake, Guilford, Cleveland, Union, Johnston, New Hanover, and Pender (Census of Agriculture). Mecklenberg County accounted for 26 percent of total sales that year. Pender, Henderson, Sampson, and Wake counties had at least 30 acres of floriculture crops in the open.

#### Grower Practices

About 95 percent of North Carolina's floriculture crops are greenhouse-grown (Bailey). Field-grown crops comprise the remaining five percent, and include mainly cut flowers. Some bedding plants are moved from the greenhouse during the last four weeks of production for hardening. When moved, these young plants remain in flats or cell packs. About 50 percent of the field-grown

floriculture crops and all greenhouse-grown crops are irrigated. Irrigation is not used in high rainfall areas.

Most of North Carolina's floriculture crops are sold to garden centers, mass merchandisers, and retail florists. An estimated 30 percent of the bedding plants are shipped out of state, to as far away as Boston (Bailey). Bedding plants are also shipped to Florida and Texas.

#### Production Perils

North Carolina growers have experienced losses due to late freezes, hail storms, droughts, and floods (Bailey). Weeds are also a problem for most field-grown floriculture crops. Insect and disease problems can generally be controlled with prudent management practices.

#### Demand for Insurance

While some North Carolina growers may be interested in an in-field crop insurance policy for floriculture crops, only a few would likely participate in the buy-up insurance (Bailey). This is because a large proportion of growers' output is grown in containers under protective cover.

Data on disaster assistance payments for floriculture losses incurred during 1988-93 also indicate that there would likely be low participation among growers. Disaster assistance payments for cut flowers and cut greens, the main in-ground crops in North Carolina, were very small relative to both total U.S. payments and estimated crop value (Appendix table 7d and 8d). Growers who do not have irrigation systems will be most likely to participate, and even they will likely opt for the minimum catastrophic coverage.

#### **Texas**

Texas had 899 farms growing floriculture crops in 1992, with a crop value of \$180.6 million (Census of Agriculture). Floriculture production that year covered approximately 29.6 million square feet of crops under glass or other protection, and 2,606 acres in the open. Cherokee County, in the northeastern portion of the state, accounted for the largest number of floriculture farms and about 21 percent of the state's floriculture sales. Other leading counties, located in the eastern portion of the state, include Cameron, Harris, Smith, and Dallas. Parker and Bexar counties, also important counties, are in the north central and south central portion of the state, respectively.

Bedding plants are currently the most important floriculture product in Texas. According to the Census, bedding plants accounted for 54 percent of Texas's floriculture sales in 1992, potted flowering plants accounted for 24 percent, and foliage plants accounted for 21 percent. Cut flower and cut florist green sales were less than 1 percent of the total.

## Grower Practices

The majority of Texas' floriculture crops are container-grown under protective structures; most are irrigated. One form of structure is the environmentally-controlled greenhouse. Other structures have solid side walls, roll-down sides, or retractable roofs. Some structures use polyethylene plastic, while others are made of shade cloth with bare sides (Wilkerson).

Most bedding plants in Texas are grown in flats in greenhouses that have retractable roofs. Foliage plants are grown under protective structures (shade houses) during the summer and then moved to a traditional greenhouse during the winter (Wilkerson). The walls of these shade houses can be opened or closed.

Potted flowering plants are grown under protective structures made of polyethylene plastic (Hall). Most foliage plants and flowering plants are grown in 4-inch to 6-inch pots or hanging baskets. Some palms are grown in the ground, but most foliage and bedding plants are grown exclusively in containers (Hall).

There are only a few cut flower growers in Texas and no large-scale commercial producers. Cut flower farms are scattered across the state, but the majority are located in the eastern half of the state near Dallas, Houston, and San Antonio. Depending on the particular plant variety and region of the state, cut flowers may be either field-grown or greenhouse-grown (Texas Department of Agriculture).

Most flower growers seldom rely on cut flowers as their sole source of income. They generally produce potted plants, bedding plants, vegetables, or other agricultural commodities, or they may hold a non-farm job (Texas Department of Agriculture). An increasing number of fruit and vegetable pick-your-own and road-side stand operations are finding that field-grown cut flowers provide an attractive addition to their product mix (Wilkerson).

Most Texas-grown cut flowers are lesser-known varieties, but growers generally also produce small quantities of popular varieties, including cut roses, cut mums, baby's breath, statice, lilies, and gladiolus. A few growers also specialize in the cultivation of native flowers and grasses for fresh and dried arrangements, and some specialize in cut greens (Texas Department of Agriculture).

In general, the important market outlets for Texas-grown floriculture crops are mass merchandisers (including chain discount stores and supermarkets), independent retail garden centers, re-wholesalers (growers who sell to another grower), and landscapers. The last two outlets account for only a small share of the market (Wilkerson).

Since cut flowers are a very small segment of the Texas floriculture industry, many retailers rely on wholesalers for their floral supplies. Only a few buy directly from growers, mostly in California and from farmers' markets. Many

supermarkets buy decorative plants and bedding plants directly from local growers (Texas Department of Agriculture).

#### Production Perils

Floods and hurricanes are the most common weather-related perils in Texas (Wilkerson). Winter rains, such as the ones that drenched Texas in 1992, can also cause flooding and crop losses. While floods left little long-term effect for the nursery industry, heavy rains put a huge damper on retail sales for the spring season (Texas Association of Nurserymen). An early fall freeze in October, 1991, caused some losses to foliage plant growers in Van Zandt County (USDA, CFSA). Insect and disease problems are not a major concern because they can be prevented and controlled by proper management practices.

The hot, humid weather in most parts of Texas, particularly when accompanied by high night-time temperatures, is a barrier to cut flower production because many varieties do not bloom at all or are of poor quality when grown in such conditions. The hot climate in Texas makes it difficult for growers to maintain consistent quality and supply (Texas Department of Agriculture).

#### Demand for Crop Insurance

There probably would be relatively little interest in an in-ground crop insurance policy in Texas because the majority of the floriculture crops are grown in containers. Growers who do produce field-grown floriculture crops are likely to indicate some interest in the policy, particularly if their farms are located along the Coastal counties which are prone to hurricane-generated winds.

Drought is not considered a serious problem because a majority of farms have irrigation systems. Progressive growers will be more inclined to have an interest in a crop insurance policy because of the very large capital investment that they have to protect (Hall).

Based on past ad hoc disaster assistance payments, cut flower and cut green growers will perhaps show a moderate interest in a crop insurance policy for field-grown floriculture crops. However, cut flower production is only a small segment of Texas's floriculture industry.

Foliage and bedding plant growers received less than 1 percent of total ad hoc disaster assistance payments for foliage plant and bedding plant losses between 1988 through 1993 (Appendix tables 7a and 7c). In addition, these disaster payments represented a negligible share of their estimated crop value (Appendix tables 8a and 8c).

#### **Ad Hoc Disaster Assistance for Floriculture Crops**

Ad hoc disaster assistance legislation was made available for losses of commercially-grown crops in each of the years 1988-93. Ad hoc payments provide an indication of high-loss areas during that period, and may indicate

states and counties that would face relatively high risk under a potential FCIC policy for floriculture crops. These data may also suggest the areas where the demand for a crop insurance policy for floriculture products would be relatively high.

#### Disaster Assistance Payments for Foliage Plants

Disaster assistance payments for foliage plant losses totalled about \$5.9 million over the 1988-93 period (Appendix table 7a). Disaster payments peaked at \$3.6 million in 1993, were about \$1.5 million in 1990, and totaled \$761,000 for 1991 and 1992. No payments were reported during 1988 and 1989.

Florida accounted for about 99 percent of the disaster payments for foliage plant losses between 1990 and 1993. Florida was also the only state that collected disaster payments in all of the four years. Hawaii, Iowa, Kansas, Mississippi, North Carolina, Pennsylvania, and Texas received payments in at least one of the four years. Pennsylvania collected the second-largest payments during that period, at about \$36,400, followed by Hawaii, at \$5,800.

Twenty-six counties received disaster payments for foliage plant losses in at least one year since 1990. Fifteen counties were in Florida, three were in Pennsylvania, and two each were in Iowa and Mississippi. Dade County, Florida, ranked first in payments for foliage plant losses, receiving a total of \$4.4 million, about 76 percent of the U.S. total. The next three counties in the series include: Lake County, Florida (\$546,200); Orange County, Florida (\$306,000); and Palm Beach County, Florida (\$235,000).

#### Disaster Assistance Payments for Flowering Plants

Disaster assistance payments for flowering plant losses totalled about \$1.3 million over the 1988-93 period (Appendix table 7b). Payments for flowering plant losses peaked at \$946,400 in 1993, and were about \$285,700 in 1990. There were no payments for flowering plant losses reported during 1988 and 1989. Payments in 1991 and 1992 amounted to about \$102,800.

Florida collected \$1.2 million in disaster assistance payments for flowering plant losses during 1990-93, nearly 93 percent of the U.S. total. Florida was also the only state that collected payments in all of the four years. While ten other states also received payments in at least one of the four years, their shares were less than one percent of the total, with the exception of Hawaii (3.4 percent) and Georgia (2.1 percent). Four of the states that received payments were in the South, five were from the North Central region, and one each was located in the Northeast and West.

A total of 21 counties received ad hoc disaster payments for flowering plant losses in at least one of the four years between 1990 and 1993. Eleven of the counties were in Florida. Other counties receiving payments were located in Hawaii, Georgia, Wisconsin, Louisiana, Ohio, Iowa, Kansas, Minnesota, Massachusetts, and North Carolina.

In an ordering of counties, Dade County, Florida ranked first in payments for flowering plant losses, receiving a total of \$937,600 over the 4-year period, about 70 percent of the U.S. total. The next three counties in the series include: Palm Beach County, Florida (\$232,700); Kauai County, Hawaii (\$45,700); and Orange County, Florida (\$38,800).

#### Disaster Payments for Bedding Plants

Disaster assistance payments for bedding plant losses totalled about \$976,500 over the 1988-93 period (Appendix table 7c). Payments peaked at \$315,900 in 1992, and were about \$1,300 in 1989. A total of 19 states collected payments in at least one of the six years. Seven of the states were from the southern region, six from the North Central region, four from the Northeast region, and two from the West.

Georgia and North Carolina were the only states that collected ad hoc disaster payments for bedding plant losses for four consecutive years, beginning in 1990. Georgia collected a total of \$655,200, about 67 percent of the U.S. total. North Carolina collected \$204,700, about 21 percent of the total. The remaining 17 states each collected less than 1 percent of the U.S. total, except for California (3.4 percent), Missouri (2.2 percent), New Jersey (1.9 percent), and Alabama (1.6 percent).

Fifty-three counties received ad hoc disaster payments for bedding plant losses in at least one of the six years from 1988 to 1993. Twelve of the counties were in Georgia and eight each were in North Carolina and California. Pierce County, Georgia received the largest disaster payment over the six-year period, and accounted for about a quarter of the total disaster payments for bedding plants. The next three counties in the series include: Tift County, Georgia (\$156,900); Berrien County, Georgia (\$101,600); and Polk County, North Carolina (\$100,000).

#### Disaster Assistance Payments for Cut Flowers and Cut Greens

Disaster assistance payments for cut flower and cut green losses totalled \$5.96 million over the 1988-93 period (Appendix table 7d). The two largest payments were collected during 1991 (\$2.1 million) and in 1993 (\$2.0 million). There were 38 states that collected disaster payments in at least one of the six years. California, Florida, Hawaii, Minnesota, Mississippi, and Washington collected disaster payments in four consecutive years beginning in 1990.

California and Hawaii together received about 51 percent of the disaster payments made for cut flower and cut green losses between 1988 and 1993. California collected about \$1.7 million, while Hawaii received \$1.4 million. Florida, Minnesota, Texas, Illinois, Michigan, Massachusetts, New York, Wisconsin, Washington, Ohio, and Alabama collected at least one percent of the total.

A total of 186 counties received ad hoc disaster payments for cut flower and cut green losses in at least one of six years between 1988 and 1993 (Figure

8). The states with the largest number of counties collecting payments include Minnesota (27 counties), California (17 counties), Florida (14 counties), Michigan (14 counties), and Massachusetts (11 counties). Hawaii County, Hawaii ranked first, receiving a total of nearly \$1.2 million over the 6-year period, about 20 percent of the U.S. total.

## **Non-containerized Floriculture Crop Insurance Implementation Issues**

### **Adverse Selection**

Adverse selection arises when growers have more complete information about the likelihood of crop losses than the insurer, and use this superior information to their advantage in deciding whether or not to purchase insurance. The greatest chance for adverse selection in insuring in-ground floriculture crops is likely to be associated with losses due to freeze, frost, or floods. These losses tend to be field-specific and require the insurer to know the risk associated with insuring individual fields. Crops grown in low-lying areas or flood plains are more likely to incur losses due to floods than those fields at higher elevations. Fields at lower elevations are also more susceptible to losses due to frosts and freezing temperatures.

Adverse selection is not likely to be associated with the major production perils--hurricanes, strong winds, and hail. These tend to affect all fields more or less equally over a wide area, and both growers and the insurer are likely to have the comparable information about the chances of loss.

### **Setting Reference Prices**

FCIC provides reference prices (price elections) for insured crops, which become the basis for assigning values to yield losses. Insured growers select the level of coverage they want by electing a price guarantee based on the reference price.

The in-field value probably represents the most appropriate reference price for estimating the value of production losses in floriculture crops. Such a price would avoid reimbursing growers for non-incurred expenses for harvesting and marketing.

There are two ways of estimating the in-field value of a crop. One would be to use an estimated cost of production, excluding harvesting and marketing expenses. A second way would be to subtract the expected harvesting and marketing expenses from the current wholesale price for certain crops that have reported prices.

### **Estimating Production History**

Several different procedures may be used for estimating production history for floriculture crops because the output of different plants is measured in different ways. Yields of cut flowers, for example, are likely to be measured in terms of the number of stems harvested per acre, while the yield of cut

cultivated greens would be measured in terms of bunches harvested. Foliage plant and potted flowering plant yields are measured in terms of number of plants harvested.

For some plants, such as tropical foliage plants, yield history may not have the same meaning it does for most presently-insured crops, because they have an indeterminate growing season. Such plants continue growing in the field, or in containers until a buyer has been found. Production history for such plants has little value in measuring yield for insurance purposes. A few large plants of a given specie may represent more yield and value than a larger number of small plants.

Value of sales may be a plausible alternative for measuring production history for such plants. A limitation of value of sales as a measure of production history, however, is that variations in the value may be due to changes in market prices rather than changes in physical output.

#### **Estimating "Appraised Production"**

Sometimes plants retain partial value following weather-related damage. Hail, for example, may destroy the foliage, flower blossoms, and buds on cut flowers and cut greens, but not kill the plant outright. Such plants may produce salable foliage or flowers for future harvest. In such situations, the crop possesses remaining value following the damage.

One approach to appraising this remaining value would be to compute the net present value for the expenses and future in-field returns from expected production. This approach accounts for the additional expenses (for labor, fertilizer, water, etc.) needed to return the crop to salable condition. It also accounts for any increases or decreases in the crop's value following the injury. Taking into account the changes in in-field values following the injury is important because some plants may have reduced value because of the damage. Other plants, such as tropical foliage, may have greater value by the time they reach marketable condition because they are larger.

From an operational standpoint, it may be necessary to develop a rule-of-thumb guide for estimating the remaining value of damaged plants. The current containerized nursery policy uses a 90-percent rule in estimating the remaining value of damaged plants.

#### **Market Prices and Moral Hazard**

Moral hazard occurs when the grower adopts a practice that increases his or her chances of receiving an indemnity payment. Moral hazard due to low market prices is less likely to be an issue in offering crop insurance for field-grown floriculture crops than it is for perishable commodities such as fresh fruits and vegetables. The exceptions would be for cut flowers and bedding plants.

As with fresh fruits and vegetables, growers of bedding plants and cut flowers must find a buyer offering an acceptable price during the short period of time

when their commodity is ready to sell. Growers may lose their entire investment if a buyer is not found. Such a situation may make an insurance indemnity an attractive option and creates an incentive for moral hazard. For most foliage and flowering growers, on the other hand, the crops can remain "unharvested" in the field (either in-ground or in containers) until a sale has been made.

#### **Availability of Individual Grower Production Data**

Individual grower production data do not appear to be readily available. Some data can be obtained from the County Agricultural Commissioners in California. They report nursery industry data on harvested acreage and value of production for some counties. Categories that may be applicable for in-ground plants would be nursery bedding plants, vegetable bedding plants, herbaceous perennials, orchid plants, potted plants, and rose plants.

The Bureau of Plant and Apiary Inspection in Florida conducts an inventory of all registered nurseries for use in determining registration fees, including nurseries growing ornamental and vegetable transplants. Ornamentals that are included are palms, orchids, succulents, tropical foliage plants, perennials, and vegetable transplants.

#### **Demand for Insurance**

Our assessment is that most growers who will participate in a potential in-field crop insurance policy for floriculture crops will only apply for the minimum catastrophic coverage. Under the minimum catastrophic coverage, growers will be compensated for crop losses that are greater than 50 percent at a payment rate of 60 percent of the expected market price. Growers, however, whose farms are located in areas prone to hurricanes, such as the Coastal counties in Florida and Texas, will likely opt for a higher coverage.

The greatest interest in purchasing buy-up insurance for in-ground nursery crops will likely be from cut-flower producers, particularly those from California, Florida and Texas. Cut flowers are more likely to be grown in the open than the other categories of in-ground floriculture crops, and are exposed, therefore, to more production perils than the other crops.

There would likely be a moderate amount of interest in purchasing buy-up insurance among growers in Hawaii because Hawaii is prone to strong winds caused by typhoons.

On a regional basis, participation in the buy-up insurance program would likely be greatest in Florida and Texas. Both are major producing states and both are susceptible to losses from hurricanes as well as freezing temperatures.

Ad hoc disaster payments data provide further evidence that the greatest interest in insurance may lie with growers in the South. A large amount of ad hoc disaster assistance payments for floriculture crops were reported in the South over the 1988 to 1993 period, a majority of which were collected by

Florida growers. Most of the losses were due to strong winds and floods from hurricanes and freezing temperatures. Except for cut flowers and cut greens, the southern region received at least 90 percent of total disaster assistance payments for floriculture crops.

Because there are few growers of in-ground floriculture crops, the potential market for such a policy is limited. Some floriculture crops are grown in-ground and exposed to full sun for some period during their production, but a large proportion of floriculture crops are produced in some type of container throughout their life cycle, and these would be covered by the policy for containerized plants. The major floriculture crops grown in-ground for an extended period are cut flowers and cut greens.

#### **Other Implementation Issues**

FCIC might consider requiring growers to comply with mandatory state inspection programs prior to sign-up for insurance. Such a requirement could help avoid insuring growers who are trying to abuse the program by insuring crops that have serious disease or weed problems. FCIC might also require growers to undergo a soil test to ensure a nematode-free area, especially for areas that have had previous nematode problems.

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